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Zero Retries is an independent newsletter about technological innovation in Amateur Radio. Zero Retries promotes Amateur Radio as (literally) a license to experiment with radio technology.

About Zero Retries

Steve Stroh N8GNJ, Editor

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Request To Send

~~Some~~ *Most* weeks now I feel a bit like Alice In Wonderland following the White Rabbit down the rabbit hole to Wonderland. *This* week the "rabbit hole" discoveries started out as a Feedback Loop item… which cascaded into discoveries of Amateur Radio units and systems that I had never heard of, resulting in the article that consumed most of this issue.

Then there was another "quick mention" item slated for Updata… which ended up consuming hours of research and becoming another issue-consuming article that had to get pushed to a future issue.

If *you* have fun reading Zero Retries and discovering new things about Technological Innovation in Amateur Radio… believe me, I have *more* fun bringing these discoveries to you - because it's a lot more fun to share.

Feedback Loop
I appreciate those of you who provide feedback, suggestions, pointers, etc. for Zero Retries. I apologize that I haven't been systematic enough to acknowledge all of your generous feedback, or do so in an appropriate timeframe. Feedback is incredibly valuable and useful to any publication. Thus, acknowledgement of feedback ought to be the first priority of writing a new issue of Zero Retries, and I've made some process changes to do so. Acknowledging feedback received prior to 2023-01-01 would be "old news", so apologies to those whose feedback prior to 2023 I haven't acknowledged. I *think* I've

caught up with any unacknowledged feedback in 2023 in this issue, and I will do better in future issues.

de Steve N8GNJ

Remote Mounted *Microwave* Software Defined Transceivers

By Martin Rothfield W6MRR, commentary by Steve Stroh N8GNJ

W6MRR sent me the following email re: Zero Retries 0087. I tried excerpting it as a brief mention in Feedback Loop… but there was "just too much good stuff" to leave any of it out. Thus I'm grateful to W6MRR for allowing me to reprint his email (lightly edited). And, as such things go in Zero Retries, my "brief" reply kept expanding (as I discovered more interesting info) to make this a full article.

Re: Zero Retries 0087, I wonder how much BW the RFzero can handle? We are working on a RP2040 / Si5351 based TX GPS Pico tracker [see image below] - assuming that's still a thing. The ATMega328 can handle APRS on VHF so this will be interesting. The ARM is much more powerful than even the RP2040.

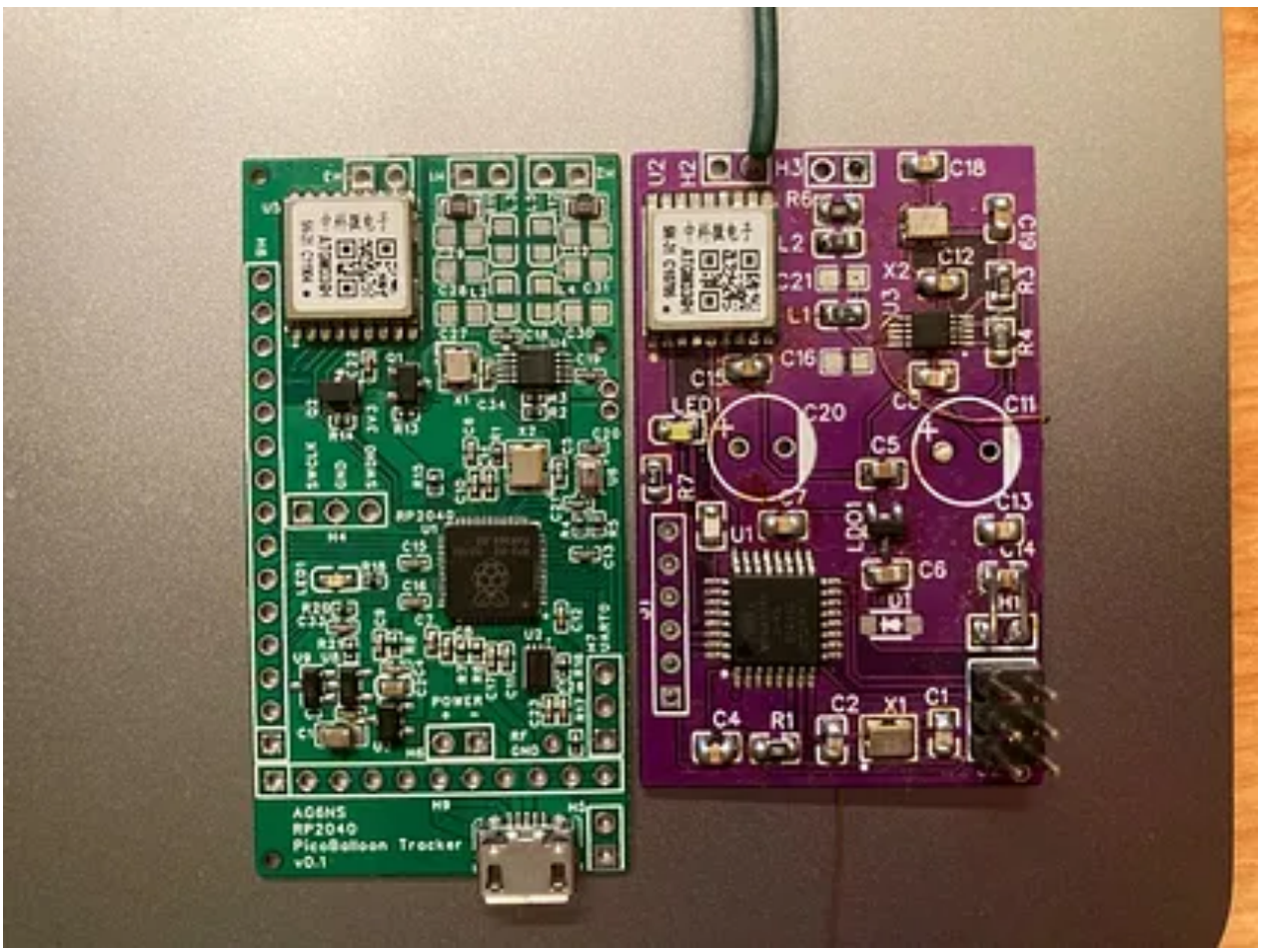

Image courtesy of Martin Rothfield W6MRR

The [50 MHz and Up Group] has been discussing upgrading their 10 GHz repeater. It has been decided that a SDR be used for an IF. I have occasionally brought up the idea of wider-than-SSB signals which seems a little heretical. Michelle Thompson is on the list and brought up data on 10 GHz data for sat. I

re-brought up the idea for a [Power Over Ethernet - POE] mast mounted Swiss army knife radio. Something clicked with Jim Moss N9JIM, [President of 50 MHz and Up Group].

There was a little discussion on BW limits and I suggested the [Analog Devices ADALM-PLUTO's] [Field Programmable Gate Array - FPGA] is the same as the Red Pitayas that supports 50 MHz with Ethernet. The [Pluto+] includes 1 Gbps Ethernet. I pointed out [Dr. Demin's RP wideband transceiver]. This solves a problem for sat users like Michelle. This also has potential for ATV, DTV and data networking. There are also all the bands above that need protection.

The general idea is a standard POE mast mount radio that allows uploadable FPGA bit-loads for different bands / applications. 10 GHz data is used in the UK and they have kit for that but I was unable to get a quote.

So far the Up / Down converter blocks are being sent out for fab and everything else is just discussion.

[W6MRR provided the following links as followup - Red Pitaya Notes (includes numerous references for using Red Pitaya as a transceiver), and Pluto+ on AliExpress.]

…

Commentary by Steve Stroh N8GNJ
W6MRR's core idea above, placing a Software Defined Transceiver on a mast, close to the antenna, powered over Ethernet, is a *great* idea.

SDR-based Repeaters
The idea of using a Software Defined Transceiver as the core of a repeater is also very intriguing. One can almost imagine the weekly video meeting of the local Experimenter Repeater Society: "All in favor of running the repeater in narrowband linear translator mode all next week, show of hands, please."

"Coordinating" an SDR-based Repeater
Another funny idea that comes to mind is "coordinating" a Software Defined Repeater with the regional repeater coordination body. Filling out the form, there's always some line like this:

Repeater Type (Mode) - check one:
☐FM ☐D-Star ☐YSF ☐DMR ☐P25 ☐NXDN ☐Data 1200 ☐Data 9600
☐Other _____ (fill in the blank).

Imagining a Software Defined Repeater, it's feasible that such a form will be returned with *all of those boxes checked*, including Other filled in with *"What else ya got?"*. When the humorless, unimaginative regional repeater coordination body responds with "You can only choose one mode.", the group replies: *"OK… let's call it FM… on alternate Tuesdays."*

10 GHz Repeaters
Not to mention the potential of a 10 GHz repeater. There's much to admire about the 50 MHz and Up Group having an abundance of imagination and capabilities to make good use of Software Defined Radio, Microwave Amateur Radio bands, and high points in good radio range to a dense population of techies.

One key point in imagining the above that may not be apparent, is that Amateur Radio repeater systems *don't have to be symmetrical*. For example, the output of that 10 GHz repeater can accommodate a *number of modes simultaneously*, such as a Digital Amateur Television (DATV) output, multiple 100 kHz channels for data modes such as Icom's 128 kbps Digital Data (DD) mode and New Packet Radio's 500 kbps data mode. There's enough bandwidth available on a 10 GHz transmitter that *many* inputs on

various bands could be accommodated. For example, use a KrakenSDR as the receiver - five independent receivers, each of which can receive from 4 MHz to 1.766 GHz. With a reasonable Software Defined Receiver, all of those modes can be "parsed" out of the 10 GHz transmission.

These scenarios might seem fantastical, but in my assessment, all of this is not only *doable* now, but *practical* now given the equipment available and the increasingly available radio hardware such as transverters. *The possibilities are endless!* We just need some experts, such as those available within the 50 MHz and Up Group1, to help us figure this out, replicate it, document it, and help troubleshoot it. We've done this before… 64-bit multicore microcomputers and UNIX-like operating systems used to be mysterious, expensive, and accessible only to experts… now they're appliances.

PLUTO+
I had seen a previous reference to the Pluto+, but a quick glance left me with the impression that it was a slightly improved version (basically, a less-expensive clone) of the ADALM-PLUTO. My impression was incorrect!

- The PLUTO+ includes two transmitters and two receivers versus the ADALM-PLUTO's single transmitter and single receiver.
- The frequency range of the PLUTO+ is 70 MHz to "~6 GHz" versus the ADALM-PLUTO's frequency range of 325 MHz to 3.8 GHz. Yay! The Pluto+ can accommodate the Amateur Radio 2 meter (144-148 MHz) and the US 1.25 meter (219 / 222-225 MHz) bands!
- The PLUTO+ provides a Gigabit Ethernet data interface versus the ADALM-PLUTO's USB 2.0 data (and power) interface.

Thus the PLUTO+ is a significant improvement in capability beyond the ADALM-PLUTO. Elekitsorparts Store is a trustworthy vendor that sells the PLUTO+, and of course, it's also available from "many fine sellers" on eBay.

Red Pitaya
While the PLUTO+ doesn't seem to be capable of POE, the Red Pitaya SIGNALlab 250-12 can be powered via POE. Of course, there's the significant difference in price - $330 versus $2000. The Red Pitaya is a mature family of units, and has continually evolved and is fully compatible with open source Software Defined Radio software such as GNU Radio.

IC-905 Versus Remote Mounted SDR
The more thought one gives about the possibilities of a remote mounted Software Defined Radio such as the Red Pitaya… one starts to wonder about the wisdom of investing in a "fixed function radio" such as the Icom IC-905.

The primary advantage of the IC-905 over a Software Defined Transceiver is that it's "plug and play" - an assembled, tested, supported, documented *product*. Another advantage is the IC-905's 144 - 148 MHz, 430 - 450 MHz, and 1240 - 1300 MHz radios are able to transmit at a reasonable power level of up to 10 watts.

But, a *project*, such as placing a Software Defined Transceiver like the Red Pitaya on a mast near the antennas, similar to the IC-905, has advantages over the IC-905.

- It's not "fixed function" like the IC-905. If there's software available for a radio function (especially in GNU Radio), the Red Pitaya can do it, such as DATV.
- Achieving reasonable power levels are "a simple matter of an appropriate power amplifier", such as the amplifier portion of the RPX-100 I discussed in RPX-100 Update in Zero Retries 0087.

- Unlike other manufacturers[2], Red Pitaya seems to welcome Amateur Radio usage of their products - see their Red Pitaya for Radio Amateurs page and Red Pitaya's Premium Transceiver Kit announcement (apparently they're just reselling this product from Smart Radio Concepts).

My apologies if this last observation seems a bit "ephemeral"… but one can *feel the sense of possibilities*… that there's just some "glue and interface" software needed to take advantage of these amazing new radio technologies to accomplish things in Amateur Radio that we haven't even dreamed about because our imaginations weren't big enough, and (most of us) didn't know what was possible with these new technologies.

Again, my Thanks to Martin Rothfield W6MRR for his feedback and permission for me to reprint it here in Zero Retries. Researching and writing this article was quite a ride down the rabbit hole.

ZR > BEACON

- The March / April 2023 issue of Surrey [British Columbia, Canada] Amateur Radio Communications (SARC) Communicator has published - all 124 amazing pages of it. This is a bimonthly Amateur Radio *magazine*… no mere club newsletter. Given its high quality content, that it's written and edited by volunteers, distributed free, electronically, worldwide… speaks profoundly to the non-viability of the Amateur Radio publishing-industrial complex hiding their content behind paywalls.

- Smart Radio Concepts' **Charly 25 products** are High performance Software Defined Transceivers based on Red Pitaya units, were a serendipitous discovery from the previous article. There is an interesting YouTube video explaining the Charly 25 project. On the page, there was this interesting item:
  Advance notice: We are working on a PA module for general application (spicing up SDR QRP TRX). The module will stand out from the mass of the own assemblies in particular through an extended frequency range. Preliminary data:
  - *Frequency range 472 kHz to 160 MHz*
  - *Output 250W CW max. 400W PEP*
  - *Gain approx. 18dB / operating voltage 50V*

- **Nate Bargmann N0NB - ☐1980s Connectivity From Rural Kansas via Amateur Radio**
  N0NB mentioned this article in an (unacknowledged - apologies!) comment on Zero Retries 0078. This is a *great* love letter to Amateur Radio from a "Digital Mostly" Amateur Radio Operator.

- In his comment, N0NB also pointed me to the **blog of John Goerzen KR0L** who also has a number of good Amateur Radio articles such as Long-Range Radios: A Perfect Match for Unix Protocols From The 70s and lorapipe - Transfer data and run a network over LoRa long-range radios (Github).

- Hunting for Space Radio Pirates on the US Military Fleet SATCOM Satellites (YouTube) - From this I discovered yet *another* engaging YouTube channel to check in on - saveitforparts.

Updata

- I finally[3] received notice that my two CaribouLite RPi HAT units have shipped from Crowd

Supply! Until Crowd Supply changes its policies to *enforce communication at regular intervals* from project creators to backers, I don't recommend being a backer of Crowd Supply projects… despite some of Crowd Supply's projects being fascinating.

- Icom Japan announcement - *Icom Inc. is pleased to announce that the long anticipated IC-905 will be released, for the United States and Australia, around the end of April 2023, and for Europe, in the summer of 2023.*
  Icom UK chimed in with pricing - *£3,549.95, including VAT* (~$4150) for the IC-905, and *£1,499.95* for the CX-10G 10 GHz transverter (~$1755).
  Congrats to Icom!

Feedback Loop

As mentioned in Request to Send, *catching up*.

Comments:

- **Nate Bargmann N0NB** re: Zero Retries 0080 - *Thanks for the link to the discussion of 6PACK and FlexNet.*
- **Nate Bargmann N0NB** re: Zero Retries 0081 - *Speculation about the "mystery radio units in the hills above Salt Lake City).*
- **Eric Grumling** re: Zero Retries 0083 - *Back in the heyday of amateur radio, at least in the United States, antennas and towers were common. Pre-Cable TV rural and suburban television reception required outdoor high gain antennas.*
- **Juan Ignacio** re: Zero Retries 0085 - *About VARA, look at this: [link].*
  The link is a good story from Norwegian Amateur Relay League about Emilie Enger Mehl, Norway's Minister of Justice, sending an email message via Amateur Radio (Winlink) using VARA HF as the transport mechanism. (Larry Gadallah NM7A also sent me a pointer to this story.)

Feedback via email:

- **Re: Zero Retries 0081** - *Have you heard of OH7STN's ideas about "Decentralized Social Media with Ham Radio" - https://www.youtube.com/c/OH8STN/videos?*
  and
  So we return to our first topic: Using FIDOnet technology over LoRa.
  This mention inspired Microblogging via Amateur Radio in Zero Retries 0083.
- **Re: Zero Retries 0086** - *Another source for radio crystals: http://www.andyquarz.de/quarze.html. This is a ham-owned business that has been in business for decades. I could imagine that you, in many cases, can simply order a "RX crystal for a Trio TR200G for 144.800 MHz" (which is the APRS QRG here in Region 1). I do not know whether [this company] is willing to do business outside of Germany.*

If you provide feedback via email, I may excerpt your feedback or include it in full. Unless you specifically grant me permission to include your name, I won't do so. Feedback may be lightly edited for clarity.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out
Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) - In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with wireless technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to anyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing ***Thanks*** to:

- Tina Stroh KD7WSF for, well, *everything!*
- **Pseudostaffers** Dan Romanchik KB6NU and Jeff Davis KE9V for continuing to spot, and write about "Zero Retries Interesting" items on their blogs that I don't spot on my own.
- **Newsletters** that regularly feature Zero Retries Interesting content:
    - Amateur Radio Weekly by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
    - Experimental Radio News by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC.
- **YouTube channels** that regularly feature Zero Retries Interesting content:
    - HB9BLA Wireless by Andreas Spiess HB9BLA
    - KM6LYW Radio by Craig Lamparter KM6LY emphasizes Amateur Radio data communications such as the DigiPi project.
    - Tech Minds by Matthew Miller M0DQW is subtitled Ham Radio - SDR - RF Projects - Software - Tutorials.
- The Substack email publishing platform makes Zero Retries possible. I recommend it for publishing newsletters.

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join ~~100~~ ~~200~~ ~~300~~ ~~400~~ ~~500~~ ~~600~~ *700+* other readers:

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Zero Retries / N8GNJ on Mastodon

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More bits from Steve Stroh N8GNJ:

- SuperPacket blog - *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*
- N8GNJ blog - *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs - Bellingham, Washington, USA*

Thanks for reading!
Steve Stroh N8GNJ / WRPS598 (He / Him / His)
These bits were handcrafted in beautiful Bellingham (The City of Subdued Excitement), Washington, USA.

2023-03-03

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1

I wish 50 MHz and Up Group could be extended to national (or International) instead of local / regional.

2

Lime Microsystems is another manufacturer of Software Defined Radios that recognizes and encourages use of their products within Amateur Radio.

3

My order for two CaribouLite RPi HAT units was placed 2022-01-13.